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Page 1 of 40

# Test Report

Verified code: 341444

Report No.: E20230331478001-4

Customer: Lumi United Technology Co., Ltd

Address: Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

Sample Name: Hub M3

Sample Model: HM-G01E

Receive Sample Date: Aug.02,2023

Test Date: Nov.29,2023 ~ Dec.04,2023

Reference Document: ETSI EN 300 328 V2.2.2 (2019-07)

Test Result: Pass

Prepared by: Chen Xiaocong  
Chen Xiaocong

Reviewed by: Jiang Tao  
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GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-01-04

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20230331478001-4	Original Issue	2023-12-15

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**1. TEST RESULT SUMMARY**

Test Item	Test mode	Test Requirement	Test Method	Class / Severity	Test Result
<b>1. Transmitter Part</b>					
RF Output Power	Mode 1	ETSI EN300 328 V2.2.2/ 4.3.2.2	ETSI EN300 328 V2.2.2/5.4.2.2.1	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.2	PASS
Power Spectral Density	Mode 1	ETSI EN300 328 V2.2.2/4.3.2.3	ETSI EN300 328 V2.2.2/5.4.3.2.1	Meet requirements: ETSI EN300 328 V2.2.2/4.3.2.3	PASS
Duty Cycle, Tx-sequence, Tx-gap	/	ETSI EN300 328 V2.2.2/4.3.2.4	ETSI EN300 328 V2.2.2/5.4.2.2.1	Meet requirements: ETSI EN300 328 V2.2.2/4.3.2.4	N/A <sup>1)</sup>
Medium Utilisation (MU) factor	/	ETSI EN300 328 V2.2.2/ 4.3.2.5	ETSI EN300 328 V2.2.2/5.4.2.2	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.5	N/A <sup>2)</sup>
Adaptivity	/	ETSI EN300 328 V2.2.2/ 4.3.2.6	ETSI EN300 328 V2.2.2/5.4.6.2.1	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.6	N/A <sup>1)</sup>
Occupied Channel Bandwidth	Mode 1	ETSI EN300 328 V2.2.2/ 4.3.2.7	ETSI EN300 328 V2.2.2/5.4.7.2.1	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.7	PASS
Transmitter unwanted emissions in the out-of-band domain	Mode 1	ETSI EN300 328 V2.2.2/ 4.3.2.8	ETSI EN300 328 V2.2.2/5.4.8.2.1	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.8	PASS
Transmitter unwanted emissions in the spurious domain	Mode 1	ETSI EN300 328 V2.2.2/ 4.3.2.9	ETSI EN300 328 V2.2.2/5.4.9.2.2	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.9	PASS
<b>2. Receiver Part</b>					
Receiver spurious emissions	Mode 2	ETSI EN300 328 V2.2.2/ 4.3.2.10	ETSI EN300 328 V2.2.2/5.4.10.2.2	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.10	PASS
Receiver Blocking	Mode 2	ETSI EN300 328 V2.2.2/ 4.3.2.11	ETSI EN300 328 V2.2.2/5.4.11.2.1	Meet requirements: ETSI EN300 328 V2.2.2/ 4.3.2.11	PASS

Note:

1. This item does not apply for equipment with a declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p, but the EUT power is less than 10dBm, so it is not applied.
2. This requirement does not apply for non-FHSS equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-FHSS equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

## 2. GENERAL DESCRIPTION OF EUT

### 2.1 APPLICANT INFORMATION

Name: Lumi United Technology Co., Ltd  
Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

Address:

### 2.2 MANUFACTURER

Name: Lumi United Technology Co., Ltd  
Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

Address:

### 2.3 BASIC DESCRIPTION OF EUT

Product Name: Hub M3  
Product Model: HM-G01E  
Adding Model: HM-G01D  
Models Difference: The model NO. HM-G01E & HM-G01D have the same technical construction including circuit diagram, PCB LAYOUT, hardware version and software version identical, except sales area and packaging are different.

Trade Name: Aqara

Power Supply: DC 5V/2A or PoE input 48V/0.27A

Frequency Band: 2405MHz-2475MHz

Modulation Type: O-QPSK

Antenna Specification: PIFA antenna 0.5dBi gain (Max.)

Sample submitting way: ☒ Provided by customer ☐ Sampling

Sample No: E20230331478001-0001, E20230331478001-0003, E20230331478001-0004

Temperature Range: -10 °C ~ 50 °C

Hardware Version: V2.0.5\_1060

Software Version: T0

Note 1: The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

Note 2: All the tests were performed on the model HM-G01E.

## 2.4 TEST MODE

Test mode 1: Thread fixed transmitting mode

Test mode 2: Thread receiving mode

## 2.5 FREQUENCY BAND AND THE TEST FREQUENCY

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
*11	2405	12	2410	13	2415	14	2420
15	2425	16	2430	17	2435	*18	2440
19	2445	20	2450	21	2455	22	2460
23	2465	24	2470	*25	2475	/	/

\* is the test frequency

## 2.6 DESCRIPTION OF ADAPTIVE EQUIPMENT

The type of the equipment	<input type="checkbox"/> FHSS	<input checked="" type="checkbox"/> other forms of modulation	<input type="checkbox"/> Non-FHSS
Adaptive / non-adaptive equipment	<input checked="" type="checkbox"/> Non-adaptive Equipment	<input type="checkbox"/> adaptive Equipment without the possibility to switch to a non-adaptive mode	<input type="checkbox"/> adaptive Equipment which can also operate in a non-adaptive mode
The equipment has an implemented	<input type="checkbox"/> Frame Based equipment	<input type="checkbox"/> Load Based equipment	<input type="checkbox"/> non-LBT based DAA mechanism <input checked="" type="checkbox"/> other
Device Class	<input type="checkbox"/> Wi-Fi	<input type="checkbox"/> Bluetooth Low Energy	<input type="checkbox"/> Bluetooth EDR/BR <input type="checkbox"/> BT 5.2
Wi-Fi Channel Bandwidth	<input type="checkbox"/> 20MHz	<input type="checkbox"/> 40MHz	<input type="checkbox"/> 80MHz <input type="checkbox"/> 160MHz
Antenna Gain	<input type="checkbox"/> Antenna 1 dBi	<input type="checkbox"/> Antenna 2 dBi	<input checked="" type="checkbox"/> Antenna 3 0.5dBi <input type="checkbox"/> Antenna 4 dBi
Beamforming Gain	<input type="checkbox"/> Yes, dBi	<input checked="" type="checkbox"/> No	
Extreme operating conditions	<input checked="" type="checkbox"/> Operating temperature range:	<input checked="" type="checkbox"/> Min -10°C	<input checked="" type="checkbox"/> Max 50°C
Blocking	<input checked="" type="checkbox"/> PER	<input type="checkbox"/> The manufacturer may declare alternative performance criteria	
Geo-location capability supported by the equipment	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	

The maximum RF output power is 6.87 dBm, so the EUT is Receiver Category 2 equipment.



### 3. LABORATORY

The tests and measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

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Shenzhen, 518110, People's Republic of China

P.C. : 518110

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### 4. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

China CNAS(L0446)

Copies of granted accreditation certificates are available for downloading from our web site,  
<http://www.grgtest.com>

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## 5. MEASUREMENTS UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in ETSI EN TR 100 028-1 (i.15) and ETSI EN 100 028-2 (i 8):

Measurement		Frequency	Uncertainty
Radiated Emission	Horizontal	30MHz~200MHz	4.0dB
		200MHz~1000MHz	4.1dB
		1GHz~18GHz	4.9dB
	Vertical	30MHz~200MHz	3.9dB
		200MHz~1000MHz	4.2dB
		1GHz~18GHz	5.0dB

Measurement	Uncertainty
RF frequency	$6.0 \times 10^{-6}$
RF power conducted	0.78 dB
Occupied channel bandwidth	0.40 dB
Unwanted emission, conducted	0.68 dB
Humidity	6.0 %
Temperature	2.0°C

This uncertainty represents an expanded uncertainty factor of  $k=2$ .

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**6. EQUIPMENT AND TOOLS USED DURING TEST****6.1 TEST EQUIPMENT AND TOOLS**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Maximum transmit power & Maximum e.i.r.p. spectral density & Occupied channel bandwidth& Transmitter unwanted emissions in the out-of-band domain				
Automatic control unit	TONSCEND	JS0806-2	2018060317	2024-08-04
Programmable constant temperature and humidity test chamber	FC	FPHC-23AW-40	FD202306015	2024-09-10
Spectrum Analyzer	R&S	FSV30	104381	2024-10-13
BT/WIFI System	TONSCEND	JS1120-3		
Transmitter unwanted emissions in the spurious domain & Receiver spurious emissions				
Spectrum Analyzer	Agilent	N9010A	MY55370330	2024-09-08
Spectrum Analyzer	R&S	FSV3044	101184	2024-08-11
Bi-log Antenna	Schwarzbeck	VULB9163	01279	2024-03-05
Horn Antenna	Schwarzbeck	BBHA9120D	02499	2024-08-26
Amplifier	Tonscend	TAP 037030	AP20E8060081	2024-04-16
Amplifier	Tonscend	TAP01018048	AP20E8060076	2024-04-16
Amplifier	Tonscend	TAP9E6343	AP20E806065	2024-04-16
Test software	tonscend	JS36-RSE/5.0.0.1		
Receiver Blocking				
Signal Generator	KEYSIGHT	N5173B	MY60403029	2024-05-15
BT/WIFI System	tonscend	JS1120-3		

Note: The calibration cycle of the above instruments is 12 months.

## 6.2 LOCAL SUPPORTIVE INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	/
Test board	/	/	/	/
Adapter	Jian Aohai	A70-050200U-EU1	/	/
PoE Adapter	UE	PoE35-54A	/	/

Note: The notebook is just used to produce fixed frequency transmitting.

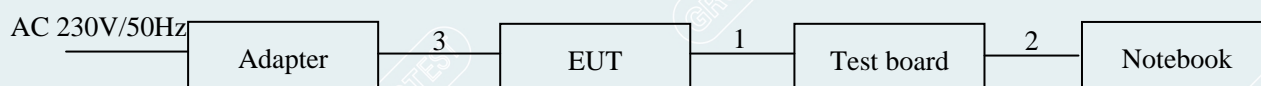
No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	Serial cable	1	No	0	0.3m
2	USB-MINI cable	1	Yes	0	1.0m
3	USB-C cable	1	Yes	0	0.8m
4	RJ45 cable	1	No	0	1.5m

## 6.3 CONFIGURATION OF SYSTEM UNDER TEST

For RF Output Power & Power Spectral density & Occupied channel bandwidth & Transmitter unwanted emissions in the out-of-band domain & Receiver Blocking



For Transmitter unwanted emissions in the spurious domain & Receiver spurious emissions



## 6.4 TEST SOFTWARE

Software version	Test level
QCOM_V1.0	2405MHz: 8 2440MHz: 8 2475MHz: 8

## 7. RADIO TECHNICAL REQUIREMENT SPECIFICATION

### 7.1 RF OUTPUT POWER

Test Requirement: ETSI EN300 328 V2.2.2/ 4.3.2.2

Test Method: ETSI EN300 328 V2.2.2/5.4.2.2.1

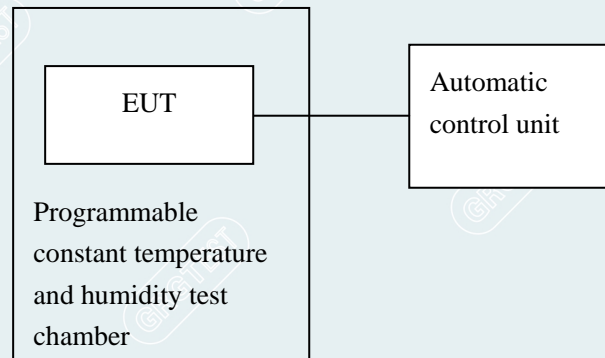
#### 7.1.1 LIMIT

For adaptive equipment, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the manufacturer and shall not exceed 20 dBm. See clause 5.4.1 m). For non-adaptive equipment, the maximum RF output power shall be equal to or less than the value declared by the manufacturer.

This limit shall apply for any combination of power level and intended antenna assembly.

#### 7.1.2 TEST CONFIGURATION



#### 7.1.3 TEST PROCEDURES

Test procedure: Test procedure is according to ETSI EN 300 328 V2.2.2/5.4.2.2.1

Test frequency: 2405MHz, 2440MHz and 2475MHz for Thread

Test condition: Normal and extreme test conditions



7.1.4 TEST RESULTS

Test Date (yy-mm-dd): 2023-11-29

Test Engineer: Huang Tianmei

Test environment: Normal condition: 22.3℃/55%RH/101.0kPa

Extreme test conditions: Low Temp: -10℃

High Temp: +50℃

Test Condition	Test mode	Antenna	Frequency [MHz]	EIRP[dBm]	Limit[dBm]	Verdict
NTNV	Thread	Ant3	2405	6.87	20	PASS
			2440	6.67	20	PASS
			2475	6.63	20	PASS
LTVN	Thread	Ant3	2405	6.87	20	PASS
			2440	6.68	20	PASS
			2475	6.64	20	PASS
HTNV	Thread	Ant3	2405	6.87	20	PASS
			2440	6.67	20	PASS
			2475	6.63	20	PASS

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## 7.2 POWER SPECTRAL DENSITY

Test Requirement: ETSI EN300 328 V2.2.2/4.3.2.3

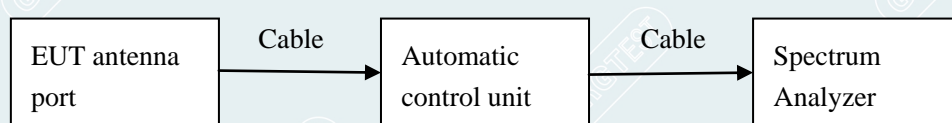
Test Method: ETSI EN300 328 V2.2.2/5.4.3.2.1

### 7.2.1 LIMIT

This requirement applies to all types of equipment using wide band modulations other than FHSS.

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

### 7.2.2 TEST CONFIGURATION



### 7.2.3 TEST PROCEDURES

Test condition: Normal test conditions

Test frequency: 2405MHz, 2440MHz and 2475MHz for Thread

Test procedure: Test procedure is according to ETSI EN 300 328 V2.2.2/5.4.3.2.1

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7.2.4 TEST RESULTS

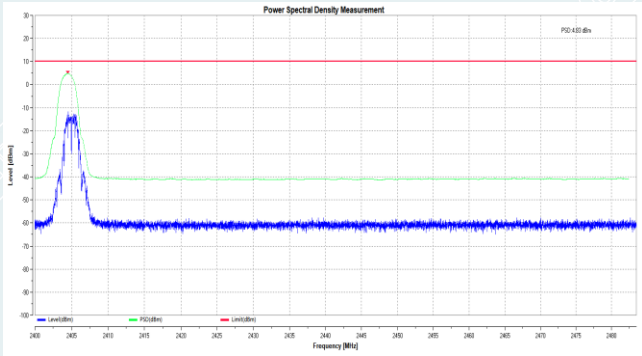
Test Date (yy-mm-dd): 2023-11-29

Test Engineer: Huang Tianmei

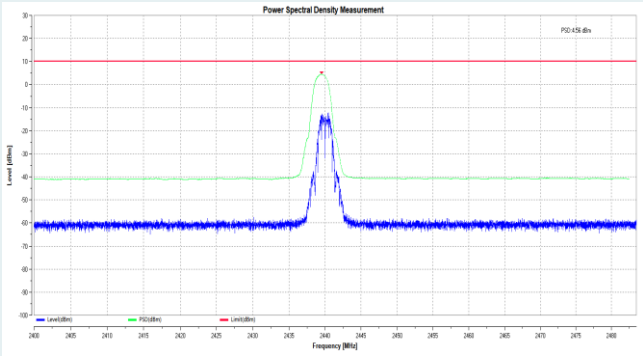
Test environment: Normal condition: 22.3°C/55%RH/101.0kPa

Test Mode	Frequency [MHz]	PSD[dBm/MHz]	Limit[dBm/MHz]	Verdict
Thread	2405	4.83	10	PASS
	2440	4.56	10	PASS
	2475	4.55	10	PASS

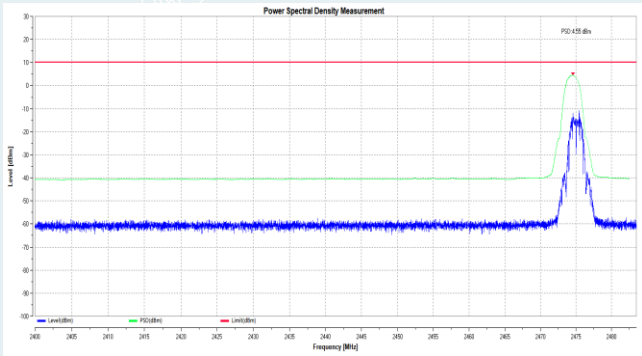
7.2.5 TEST SCREENSHOTS



Lowest Frequency: 2405MHz



Middle Frequency: 2440MHz



Highest Frequency: 2475MHz

### 7.3 OCCUPIED CHANNEL BANDWIDTH

Test Requirement: ETSI EN300 328 V2.2.2/ 4.3.2.7

Test Method: ETSI EN300 328 V2.2.2/5.4.7.2.1

#### 7.3.1 LIMIT

This requirement applies to all types of non-FHSS equipment.

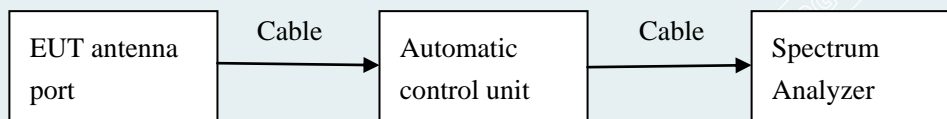
The Occupied Channel Bandwidth shall fall completely within the band given in table 2.

In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p. greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

Table 2: Service frequency bands

	Service frequency bands
Transmit	2 400 MHz to 2 483,5 MHz
Receive	2 400 MHz to 2 483,5 MHz

#### 7.3.2 TEST CONFIGURATION



#### 7.3.3 TEST PROCEDURES

Test condition: Normal test conditions.

Test frequency: 2405MHz, 2440MHz and 2475MHz for Thread

Test procedure: Test procedure is according to ETSI EN 300 328 V2.2.2/5.4.7.2.1

### 7.3.4 TEST RESULTS

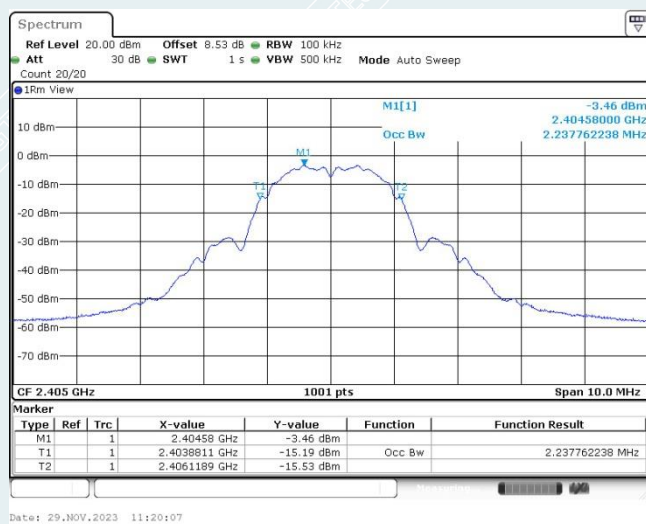
Test Date (yy-mm-dd): 2023-11-29

Test Engineer: Huang Tianmei

Test environment: Normal condition:  
22.3°C/55%RH/101.0kPa

Test Mode	Frequency [MHz]	OCB[MHz]	F <sub>L</sub> [MHz]	F <sub>H</sub> [MHz]	Limit[MHz]	Verdict
Thread	2405	2.238	2403.8811	2406.1189	2400 to 2483.5	PASS
	2440	2.238	2438.8811	2441.1189	2400 to 2483.5	PASS
	2475	2.238	2473.8811	2476.1189	2400 to 2483.5	PASS

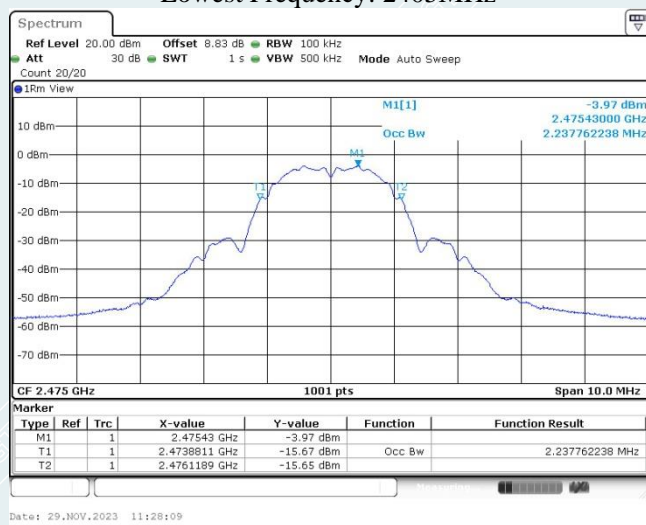
### 7.3.5 TEST SCREENSHOTS



Lowest Frequency: 2405MHz



Middle Frequency: 2440MHz



Highest Frequency: 2475MHz



## 7.4 TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

Test Requirement: ETSI EN300 328 V2.2.2/ 4.3.2.8

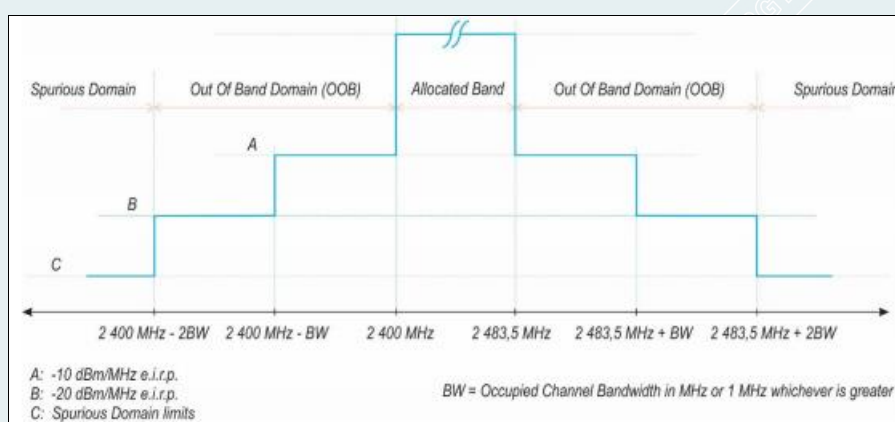
Test Method: ETSI EN300 328 V2.2.2/5.4.8.2.1

### 7.4.1 LIMIT

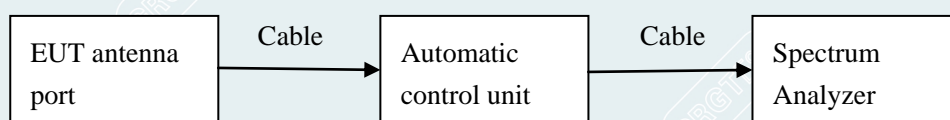
This requirement applies to all types of FHSS equipment and all types of non-FHSS equipment.

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.

The Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement.



### 7.4.2 TEST CONFIGURATION



### 7.4.3 TEST PROCEDURES

Test condition: Normal test conditions.

Test frequency: 2405MHz, 2475MHz for Thread

Test procedure: Test procedure is according to ETSI EN 300 328 V2.2.2/5.4.8.2.1

#### 7.4.4 TEST RESULTS

Test Date (yy-mm-dd): 2023-11-29

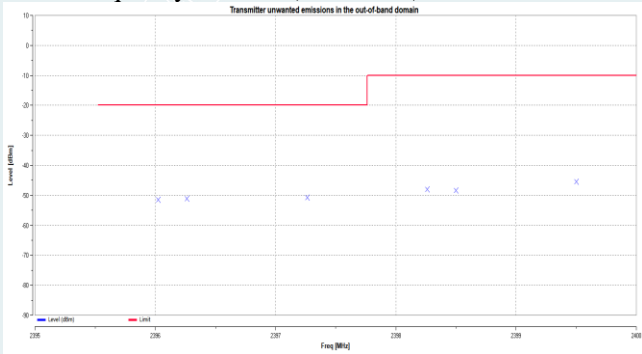
Test Engineer: Huang Tianmei

Test environment: Normal condition:  
22.3°C/55%RH/101.0kPa

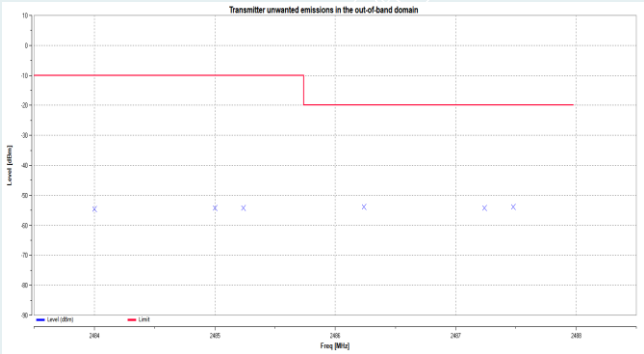
Test Mode	Frequency [MHz]	Freq. [MHz]	Level[dBm]	Limit[dBm]	Verdict
Thread	2405	2396.024	-51.41	-20.00	PASS
		2396.262	-51.09	-20.00	PASS
		2397.262	-50.68	-20.00	PASS
		2398.262	-48.05	-10.00	PASS
		2398.5	-48.31	-10.00	PASS
		2399.5	-45.54	-10.00	PASS
		2484	-54.54	-10.00	PASS
		2485	-54.29	-10.00	PASS
		2485.238	-54.28	-10.00	PASS
		2486.238	-53.93	-20.00	PASS
		2487.238	-54.32	-20.00	PASS
		2487.476	-53.78	-20.00	PASS
	2475	2396.024	-54.91	-20.00	PASS
		2396.262	-54.80	-20.00	PASS
		2397.262	-54.84	-20.00	PASS
		2398.262	-54.54	-10.00	PASS
		2398.5	-54.72	-10.00	PASS
		2399.5	-54.98	-10.00	PASS
		2484	-51.38	-10.00	PASS
		2485	-52.04	-10.00	PASS
		2485.238	-51.79	-10.00	PASS
		2486.238	-52.27	-20.00	PASS
		2487.238	-52.89	-20.00	PASS
		2487.476	-53.23	-20.00	PASS

7.4.5 TEST SCREENSHOTS

Test Frequency: Thread (2405MHz)

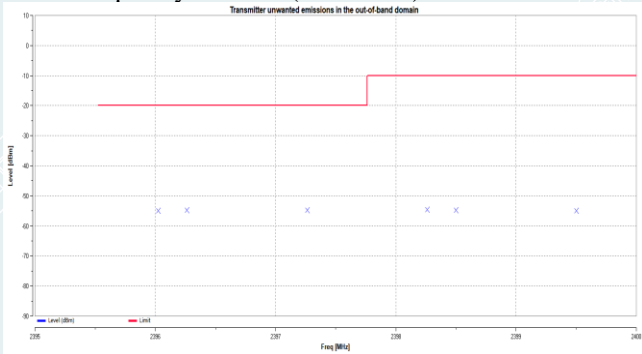


Left side of working frequency band

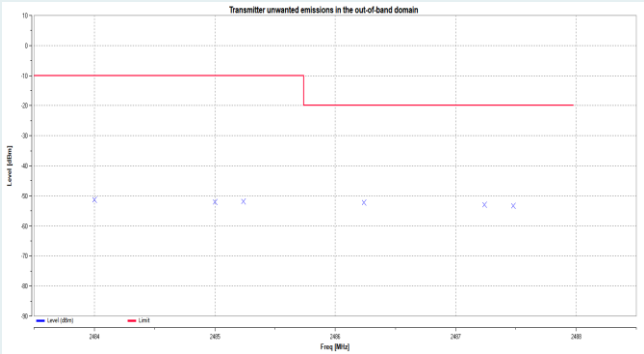


Right side of working frequency band

Test Frequency: Thread (2475MHz)



Left side of working frequency band



Right side of working frequency band

----- The following blanks -----

## 7.5 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

Test Requirement: ETSI EN300 328 V2.2.2/ 4.3.2.9

Test Method: ETSI EN300 328 V2.2.2/5.4.9.2.2

### 7.5.1 LIMIT

This requirement applies to all types of non-FHSS equipment.

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 2. In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

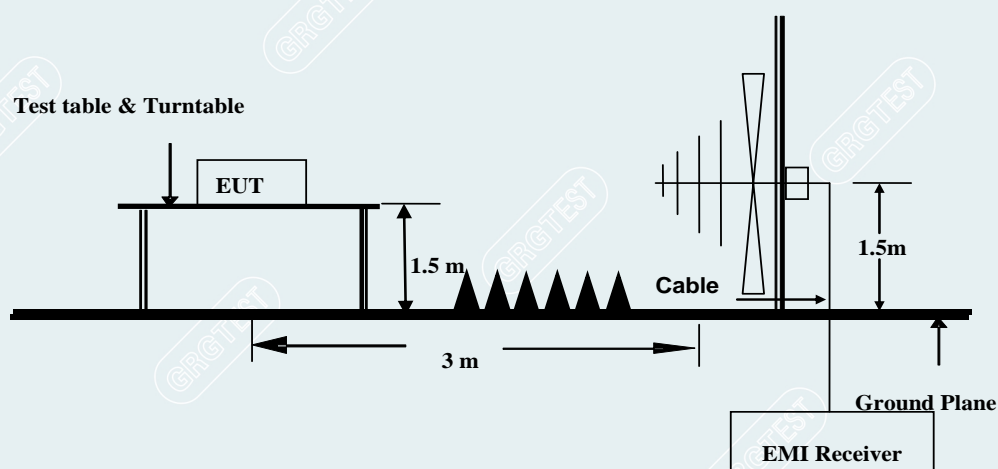
Note: This test uses conducted emissions measurement and Radiated emissions measurement.

Table 2: Transmitter limits for spurious emissions

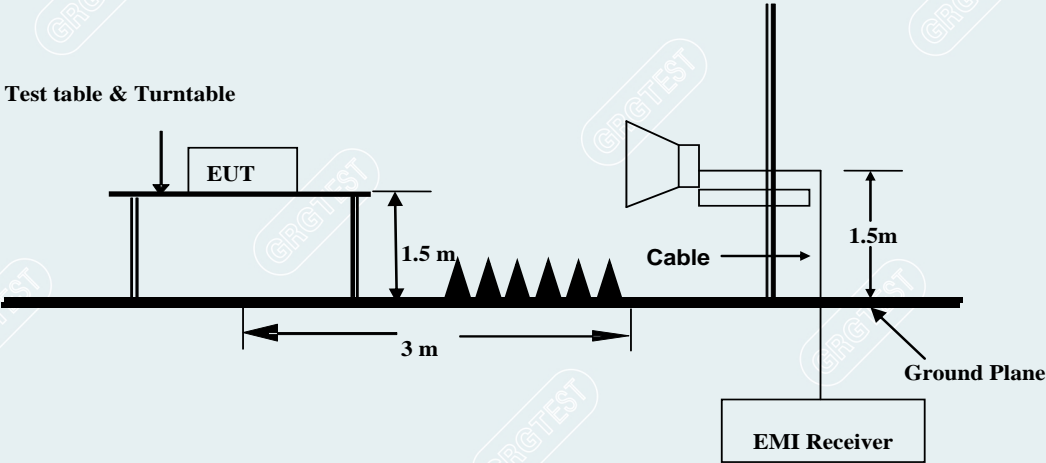
Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

### 7.5.2 TEST CONFIGURATION

30MHz~1000MHz



1000MHz~12750MHz



7.5.3 TEST PROCEDURES

- Test condition: Normal test conditions.
- Test frequency: Lowest frequency: (2405MHz), Highest frequency: (2475MHz)
- Test procedure: Test procedure is according to Clause 5.4.9.2.2 of ETSI EN 300 328 V2.2.2

7.5.4 DATA SAMPLE

Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
XXX	-49.71	-57.90	-30.00	27.90	-8.19	RMS	Horizontal

- Frequency (MHz) = Emission frequency in MHz
- Reading (dBm) = Uncorrected Analyzer / Receiver reading
- Level (dBm) = Reading (dBm) + Factor (dB)
- Limit (dBm) = Limit stated in standard
- Margin (dB) = Limit(dBm) – Level (dBm)
- RMS = Root Mean Square



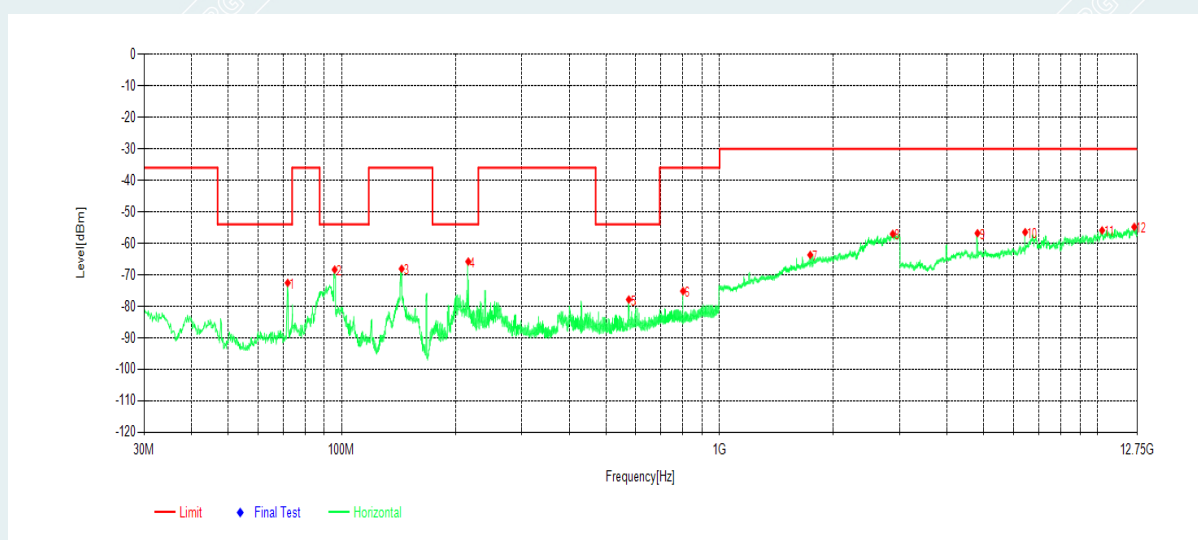
### 7.5.5 TEST RESULTS

Pre-scan all modes, the worst power supply is AC 230/50Hz (DC 5V/2A power by Adapter), in the two power supply modes, 1GHz-12.75GHz data only record the worst power supply mode (DC 5V/2A power by Adapter ) and 30MHz-1GHz records the data of two power supply modes (DC 5V/2A power by Adapter & DC 48V/0.27A power by PoE Adapter) in this report.

Power supply: AC 230V/50Hz(DC 5V/2A power by Adapter)

#### 30MHz-12.75GHz

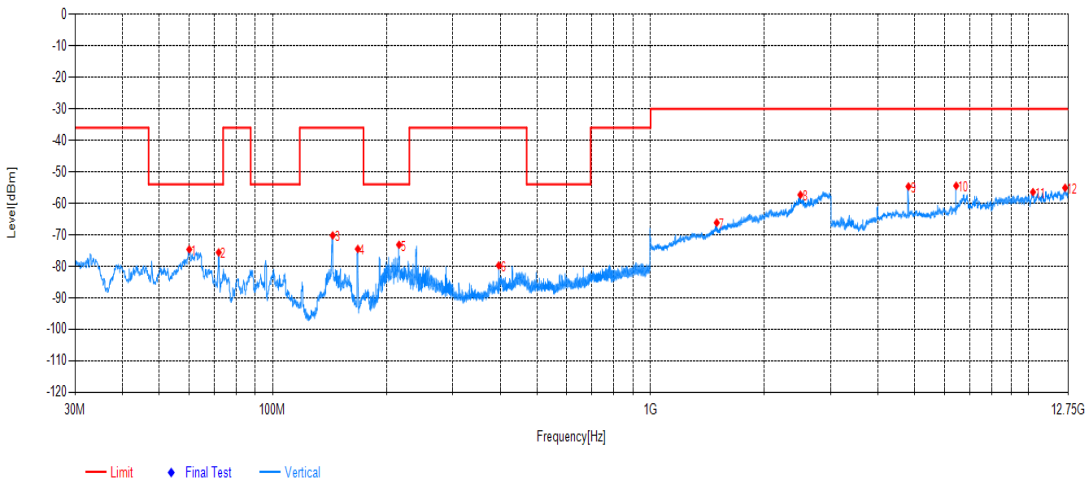
Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	TX Thread_2405MHz	Voltage:	AC 230V/50Hz
Environment:	24.4℃/44%RH/101.0kPa	Test Engineer:	Gong Xuan
Test Date:	2023-12-04	/	/



#### Suspected Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	72.001	-51.03	-72.59	-54.00	18.59	-21.56	RMS	Horizontal
2	95.863	-51.50	-68.36	-54.00	14.36	-16.86	RMS	Horizontal
3	144.169	-48.70	-68.07	-36.00	32.07	-19.37	RMS	Horizontal
4	216.337	-48.51	-65.82	-54.00	11.82	-17.31	RMS	Horizontal
5	575.14	-69.17	-77.86	-54.00	23.86	-8.69	RMS	Horizontal
6	799.986	-69.71	-75.18	-36.00	39.18	-5.47	RMS	Horizontal
7	1735.8	-69.69	-63.70	-30.00	33.70	5.99	RMS	Horizontal
8	2870	-70.34	-56.99	-30.00	26.99	13.35	RMS	Horizontal
9	4810.575	-54.90	-56.80	-30.00	26.80	-1.90	RMS	Horizontal
10	6432	-58.63	-56.47	-30.00	26.47	2.16	RMS	Horizontal
11	10272.52	-67.54	-55.90	-30.00	25.90	11.64	RMS	Horizontal
12	12498.45	-69.43	-54.80	-30.00	24.80	14.63	RMS	Horizontal

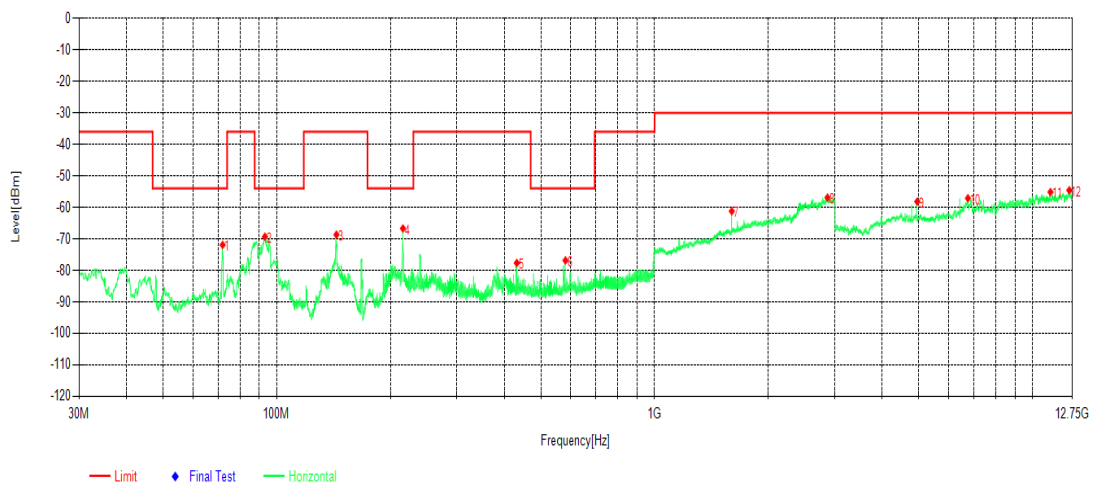
Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	TX Thread_2405MHz	Voltage:	AC 230V/50Hz
Environment:	24.4℃/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Date:	2023-12-04	/	/



Suspected Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	60.167	-62.04	-74.64	-54.00	20.64	-12.60	RMS	Vertical
2	72.001	-56.91	-75.59	-54.00	21.59	-18.68	RMS	Vertical
3	144.169	-50.94	-70.21	-36.00	34.21	-19.27	RMS	Vertical
4	168.031	-56.63	-74.50	-36.00	38.50	-17.87	RMS	Vertical
5	216.046	-55.66	-73.18	-54.00	19.18	-17.52	RMS	Vertical
6	396.466	-67.55	-79.75	-36.00	43.75	-12.20	RMS	Vertical
7	1496	-69.83	-66.15	-30.00	36.15	3.68	RMS	Vertical
8	2488.8	-69.78	-57.30	-30.00	27.30	12.48	RMS	Vertical
9	4810.575	-52.99	-54.68	-30.00	24.68	-1.69	RMS	Vertical
10	6432	-56.60	-54.43	-30.00	24.43	2.17	RMS	Vertical
11	10264.72	-67.70	-56.45	-30.00	26.45	11.25	RMS	Vertical
12	12491.62	-69.77	-55.08	-30.00	25.08	14.69	RMS	Vertical

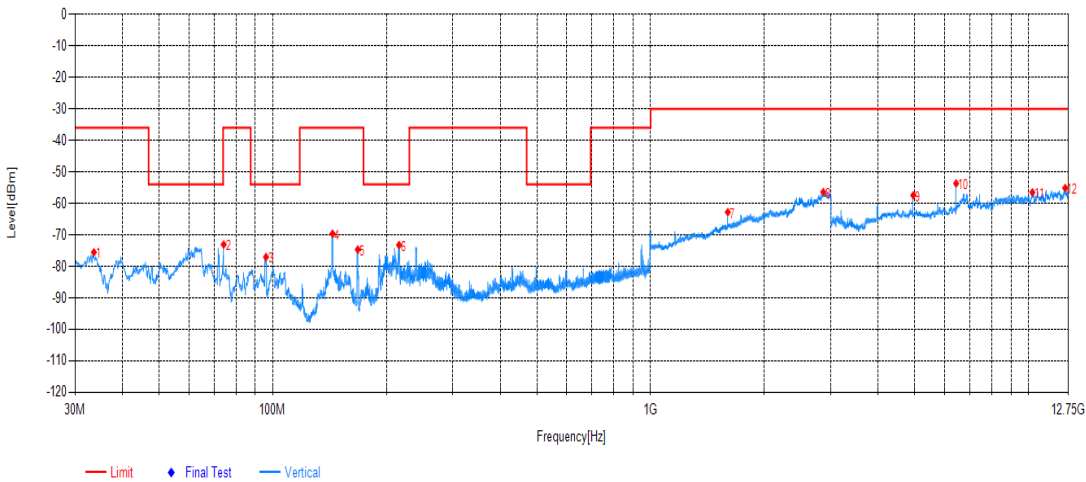
Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	TX Thread_2475MHz	Voltage:	AC 230V/50Hz
Environment:	24.4°C/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Date:	2023-12-04	/	/



## Suspected Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	72.001	-50.39	-71.95	-54.00	17.95	-21.56	RMS	Horizontal
2	93.147	-52.47	-69.36	-54.00	15.36	-16.89	RMS	Horizontal
3	143.975	-49.38	-68.71	-36.00	32.71	-19.33	RMS	Horizontal
4	215.852	-49.40	-66.73	-54.00	12.73	-17.33	RMS	Horizontal
5	431.968	-66.26	-77.69	-36.00	41.69	-11.43	RMS	Horizontal
6	580.669	-68.16	-76.87	-54.00	22.87	-8.71	RMS	Horizontal
7	1600	-65.63	-61.24	-30.00	31.24	4.39	RMS	Horizontal
8	2865.6	-70.16	-56.92	-30.00	26.92	13.24	RMS	Horizontal
9	4950.975	-57.22	-58.18	-30.00	28.18	-0.96	RMS	Horizontal
10	6744	-63.00	-57.11	-30.00	27.11	5.89	RMS	Horizontal
11	11144.17	-67.99	-55.14	-30.00	25.14	12.85	RMS	Horizontal
12	12499.42	-69.24	-54.58	-30.00	24.58	14.66	RMS	Horizontal

Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	TX Thread_2475MHz	Voltage:	AC 230V/50Hz
Environment:	24.4℃/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Date:	2023-12-04	/	/



Suspected Data List

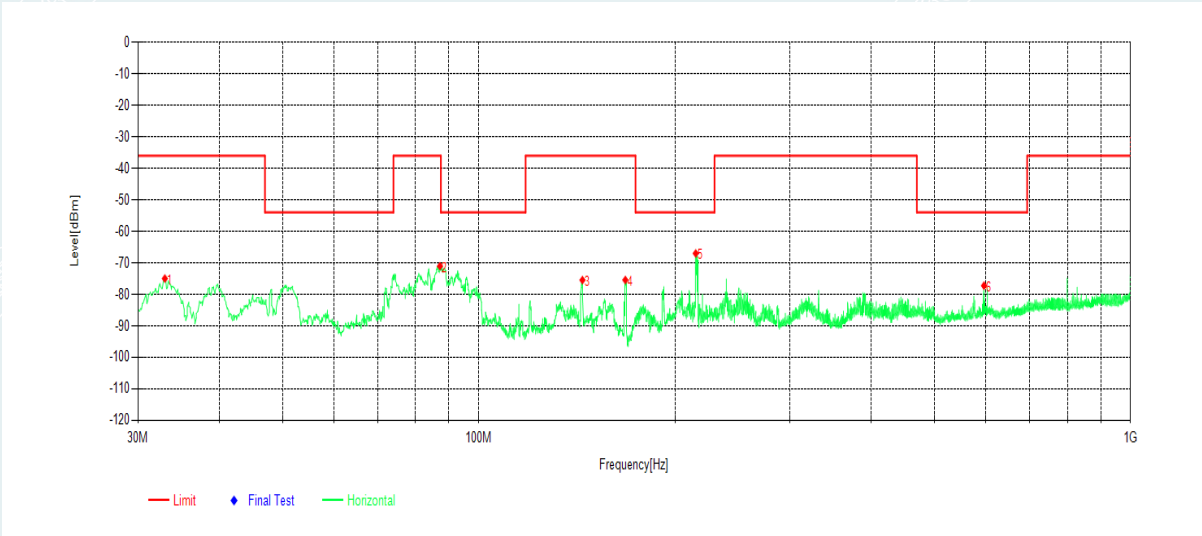
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	33.686	-59.24	-75.57	-36.00	39.57	-16.33	RMS	Vertical
2	74.232	-53.56	-73.09	-36.00	37.09	-19.53	RMS	Vertical
3	96.057	-57.74	-77.05	-54.00	23.05	-19.31	RMS	Vertical
4	144.072	-50.37	-69.65	-36.00	33.65	-19.28	RMS	Vertical
5	168.031	-56.81	-74.68	-36.00	38.68	-17.87	RMS	Vertical
6	216.046	-55.74	-73.26	-54.00	19.26	-17.52	RMS	Vertical
7	1600	-67.57	-62.79	-30.00	32.79	4.78	RMS	Vertical
8	2862.8	-69.98	-56.43	-30.00	26.43	13.55	RMS	Vertical
9	4950.975	-56.63	-57.45	-30.00	27.45	-0.82	RMS	Vertical
10	6432	-55.87	-53.70	-30.00	23.70	2.17	RMS	Vertical
11	10224.75	-67.47	-56.52	-30.00	26.52	10.95	RMS	Vertical
12	12494.55	-69.91	-55.15	-30.00	25.15	14.76	RMS	Vertical

Power supply: AC 230V/50Hz(DC 48V/0.27A power by PoE Adapter)

30MHz-1GHz

Pre-scan all modes and recorded the worst case results(TX Thread\_2405MHz) in this report.

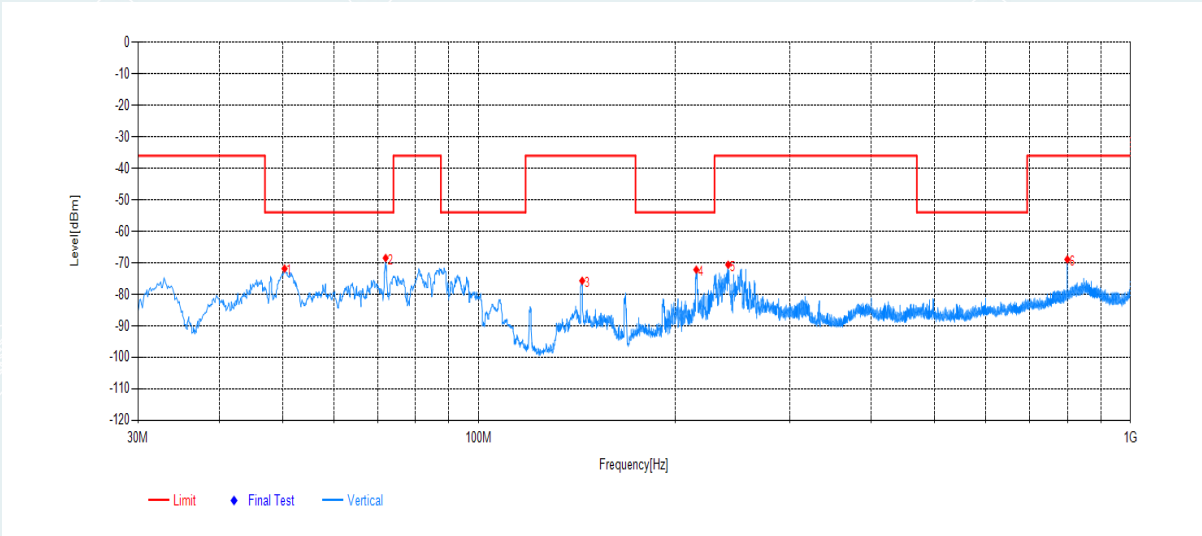
Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	TX Thread_2405MHz	Voltage:	AC 230V/50Hz
Environment:	24.4℃/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Date:	2023-12-04	/	/



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	33.007	-60.34	-75.00	-36.00	39.00	-14.66	RMS	Horizontal
2	87.23	-52.37	-71.10	-36.00	35.10	-18.73	RMS	Horizontal
3	144.266	-56.10	-75.49	-36.00	39.49	-19.39	RMS	Horizontal
4	167.837	-55.97	-75.48	-36.00	39.48	-19.51	RMS	Horizontal
5	215.27	-49.68	-67.03	-54.00	13.03	-17.35	RMS	Horizontal
6	595.801	-69.73	-77.27	-54.00	23.27	-7.54	RMS	Horizontal



Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	TX Thread_2405MHz	Voltage:	AC 230V/50Hz
Environment:	24.4℃/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Date:	2023-12-04	/	/



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	50.37	-58.48	-71.86	-54.00	17.86	-13.38	RMS	Vertical
2	72.001	-49.80	-68.48	-54.00	14.48	-18.68	RMS	Vertical
3	144.169	-56.45	-75.72	-36.00	39.72	-19.27	RMS	Vertical
4	215.658	-54.66	-72.18	-54.00	18.18	-17.52	RMS	Vertical
5	241.363	-55.07	-70.63	-36.00	34.63	-15.56	RMS	Vertical
6	799.986	-63.54	-68.95	-36.00	32.95	-5.41	RMS	Vertical

## 7.6 RECEIVER SPURIOUS EMISSIONS

Test Requirement: ETSI EN300 328 V2.2.2

Test Method: ETSI EN300 328 V2.2.2

### 7.6.1 LIMIT

The spurious emissions of the receiver shall not exceed the values given in table 3.

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted).

For emissions radiated by the cabinet or for emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p for emissions up to 1 GHz and e.i.r.p for emissions above 1 GHz.

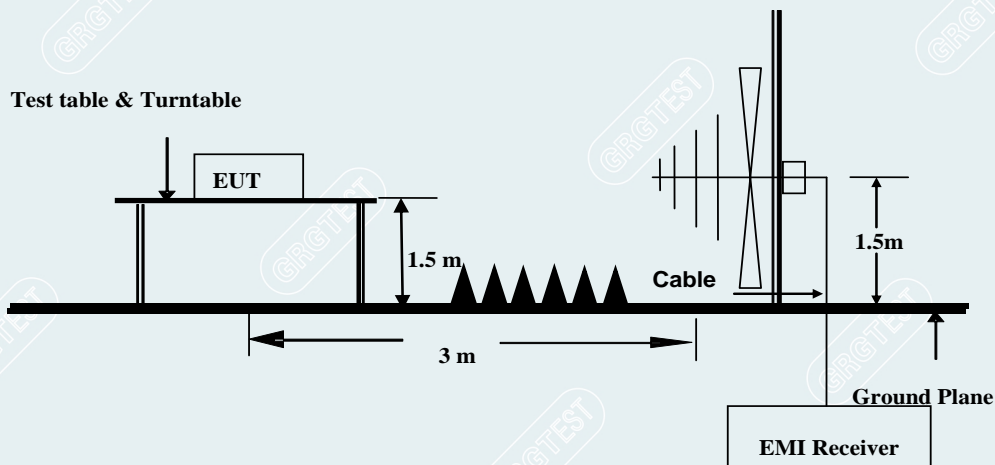
This device uses Radiated measurement.

Table 3: Spurious emission limits for receivers

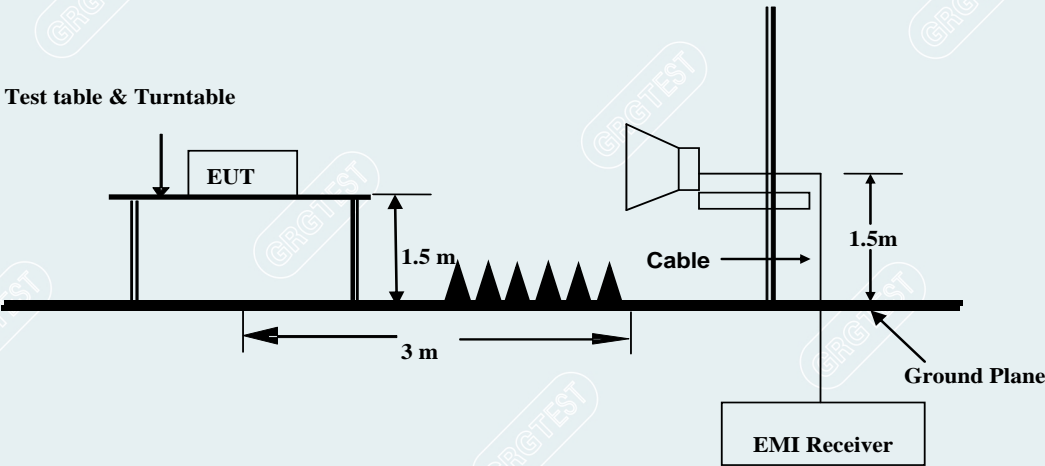
Frequency range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

### 7.6.2 TEST CONFIGURATION

30MHz-1000MHz



1000MHz-12750MHz



7.6.3 TEST PROCEDURES

- Test frequency: Lowest frequency: (2405MHz), Highest frequency: (2475MHz)
- Test condition: Normal test conditions.
- Test procedure: Test procedure is according to Clause 5.4.10.2.2 of ETSI EN 300 328 V2.2.2

7.6.4 DATA SAMPLE

Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
XXX	-58.02	-73.33	-57.00	16.33	-15.31	RMS	Horizontal

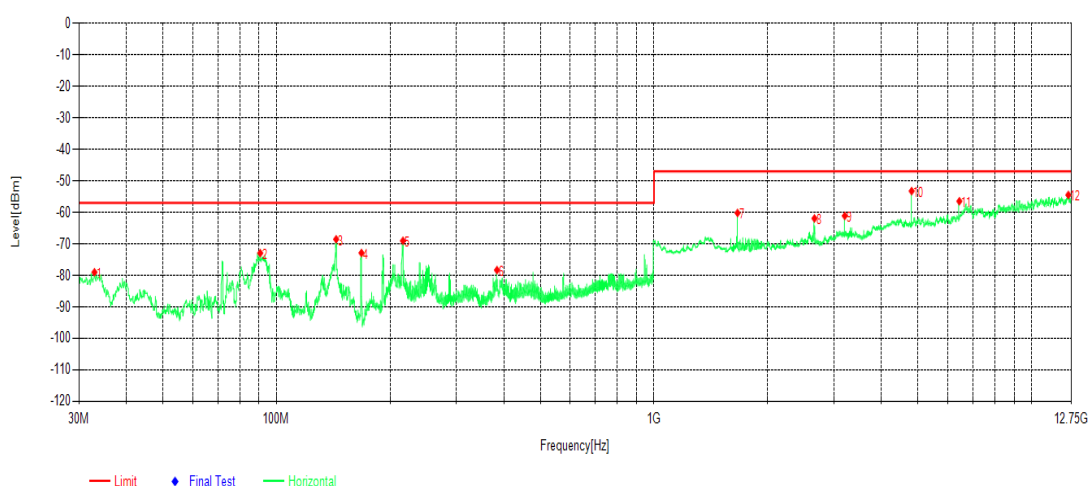
- Frequency (MHz) = Emission frequency in MHz
- Reading (dBm) = Uncorrected Analyzer / Receiver reading
- Level (dBm) = Reading (dBm) + Factor (dB)
- Limit (dBm) = Limit stated in standard
- Margin (dB) = Limit(dBm) – Level (dBm)
- RMS = Root Mean Square

### 7.6.5 TEST RESULTS

Note: Pre-scan all modes, the worst power supply is AC 230/50Hz(DC 5V/2A power by Adapter) and recorded the worst case results(RX Thread\_2475MHz) in this report.

Power supply: AC 230V/50Hz (DC 5V/2A power by Adapter)

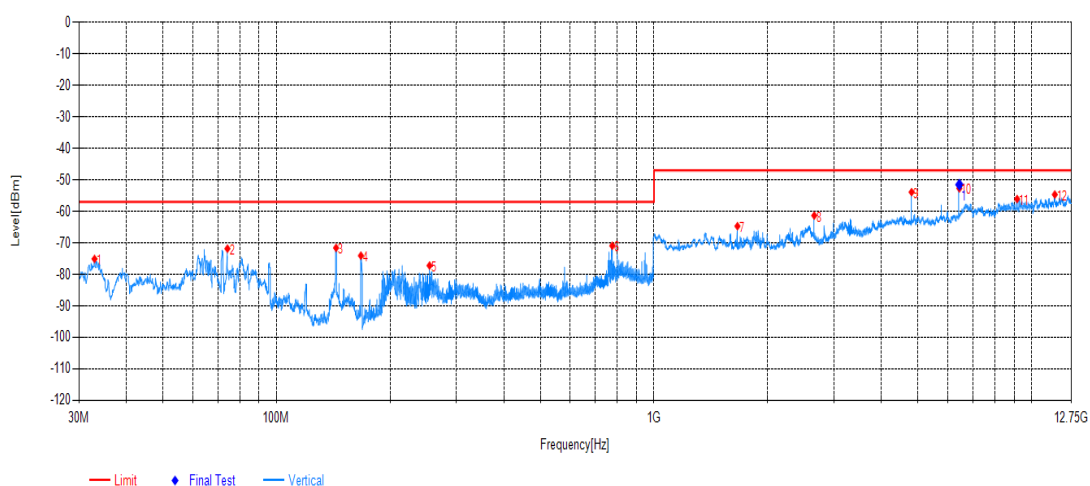
Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	RX Thread_2475MHz	Voltage:	AC 230V/50Hz
Environment:	24.4°C/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Data:	2023-12-04	/	/



#### Suspected Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	33.007	-64.38	-79.04	-57.00	22.04	-14.66	RMS	Horizontal
2	90.625	-56.06	-72.97	-57.00	15.97	-16.91	RMS	Horizontal
3	143.975	-49.24	-68.57	-57.00	11.57	-19.33	RMS	Horizontal
4	168.031	-53.43	-72.93	-57.00	15.93	-19.50	RMS	Horizontal
5	216.337	-51.74	-69.05	-57.00	12.05	-17.31	RMS	Horizontal
6	383.953	-66.43	-78.36	-57.00	21.36	-11.93	RMS	Horizontal
7	1663.875	-47.29	-60.21	-47.00	13.21	-12.92	RMS	Horizontal
8	2657.925	-51.96	-61.95	-47.00	14.95	-9.99	RMS	Horizontal
9	3199.6	-54.04	-61.15	-47.00	14.15	-7.11	RMS	Horizontal
10	4807	-51.33	-53.27	-47.00	6.27	-1.94	RMS	Horizontal
11	6432.025	-58.53	-56.50	-47.00	9.50	2.03	RMS	Horizontal
12	12503.25	-69.21	-54.47	-47.00	7.47	14.74	RMS	Horizontal

Project No	E20230331478001	EUT:	Hub M3
Model:	HM-G01E	Sample No:	E20230331478001-0004
Mode:	RX Thread_2475MHz	Voltage:	AC 230V/50Hz
Environment:	24.4°C/44%RH/101.0kPa	Engineer:	Gong Xuan
Test Data:	2023-12-04	/	/



## Suspected Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	33.007	-58.56	-75.13	-57.00	18.13	-16.57	RMS	Vertical
2	74.232	-52.35	-71.88	-57.00	14.88	-19.53	RMS	Vertical
3	143.975	-52.32	-71.61	-57.00	14.61	-19.29	RMS	Vertical
4	167.449	-56.25	-74.10	-57.00	17.10	-17.85	RMS	Vertical
5	254.458	-60.94	-77.25	-57.00	20.25	-16.31	RMS	Vertical
6	774.96	-65.39	-70.96	-57.00	13.96	-5.57	RMS	Vertical
7	1662.7	-52.10	-64.73	-47.00	17.73	-12.63	RMS	Vertical
8	2656.75	-51.42	-61.34	-47.00	14.34	-9.92	RMS	Vertical
9	4807	-52.19	-53.92	-47.00	6.92	-1.73	RMS	Vertical
10	6432.025	-54.75	-52.71	-47.00	5.71	2.04	RMS	Vertical
11	9146.275	-65.99	-56.11	-47.00	9.11	9.88	RMS	Vertical
12	11506.85	-68.45	-54.68	-47.00	7.68	13.77	RMS	Vertical

## Final Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Detector	Polarity
1	6432.025	-53.57	-51.53	-47.00	4.53	2.04	RMS	Vertical



## 7.7 RECEIVER BLOCKING

Test Requirement: ETSI EN300 328 V2.2.2/ 5.4.11.1

Test Method: ETSI EN300 328 V2.2.2/ 5.4.11.2

### 7.7.1 LIMIT

For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

The blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for.

#### Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking Signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133dBm+10 × log <sub>10</sub> (OCBW)) or -68dBm whichever is less (see note 2)	2380 2504	-34	CW
(-139dBm+10 × log <sub>10</sub> (OCBW)) or -74dBm whichever is less (see note 3)	2300 2330 2360 2524 2584 2674		
NOTE 1: OCBW is in Hz.			
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P <sub>min</sub> + 26 dB where P <sub>min</sub> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.			
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P <sub>min</sub> + 20 dB where P <sub>min</sub> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.			
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured positioned as recorded in clause 5.4.3.2.2.			

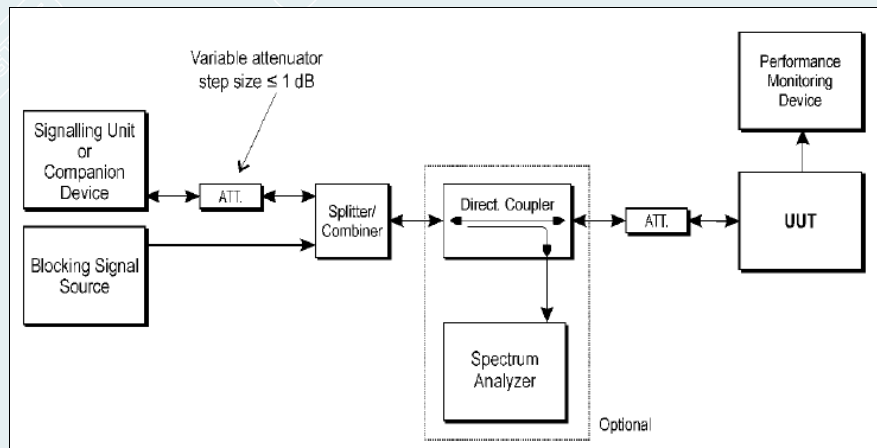
**Receiver Blocking parameters for Receiver Category 2 equipment**

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking Signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
$(-139\text{dBm} + 10 \times \log_{10}(\text{OCBW}) + 10\text{dBm})$ or $(-74\text{dBm} + 10\text{dBm})$ whichever is less (see note 2)	2380 2504 2300 2584	-34	CW
<p>NOTE 1: OCBW is in Hz.</p> <p>NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to <math>P_{\min} + 26</math> dB where <math>P_{\min}</math> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.</p>			

**Receiver Blocking parameters for Receiver Category 3 equipment**

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking Signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
$(-139\text{dBm} + 10 \times \log_{10}(\text{OCBW}) + 20\text{dBm})$ or $(-74\text{dBm} + 20\text{dBm})$ whichever is less (see note 2)	2380 2504 2300 2584	-34	CW
<p>NOTE 1: OCBW is in Hz.</p> <p>NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to <math>P_{\min} + 30</math> dB where <math>P_{\min}</math> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.</p>			

### 7.7.2 TEST CONFIGURATION



### 7.7.3 TEST PROCEDURES

Test condition: Keep the EUT on the lowest and Highest channel working mode.

Test procedure: Step 1:

Test condition: For non-FHSS equipment, the UUT shall be set to the lowest operating channel on which the blocking test has to be performed (see clause 5.4.11.1).

Step 2:

The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.

Step 3:

With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6.

Unless the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the level of the wanted signal shall be set to the value provided in the table corresponding to the receiver category and type of equipment. The test procedure defined in clause 5.4.2, and more in particular clause 5.4.2.2.1.2, can be used to measure the (conducted) level of the wanted signal however no correction shall be made for antenna gain of

the companion device (step 6 in clause 5.4.2.2.1.2 shall be ignored). This level may be measured directly at the output of the companion device and a correction is made for the coupling loss into the UUT. The actual level for the wanted signal shall be recorded in the test report.

When the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is  $P_{min}$ . This signal level ( $P_{min}$ ) is increased by the value provided in note 2 of the applicable table corresponding to the receiver category and type of equipment.

Step 4:

The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment.

If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 are met then proceed to step 6.

Step 5:

If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been increased with a value equal to the Occupied Channel Bandwidth except:

- For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted

signal shall be increased by 3 dB.

- For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.

If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been decreased with a value equal to the Occupied Channel Bandwidth except:

- For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.

- For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.

If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, the UUT fails to comply with the Receiver Blocking requirement and step 6 and step 7 are no longer required.

It shall be recorded in the test report whether the shift of blocking frequencies as described in the present step was used.

Step 6:

Repeat step 4 and step 5 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

Step 7

For non-FHSS equipment, repeat step 2 to step 6 with the UUT operating at the Highest operating channel on which the blocking test has to be performed (see clause 5.4.11.1).

Step 8

It shall be assessed and recorded in the test report whether the UUT complies with the Receiver Blocking requirement.

Keep the EUT on the lowest and Highest channel working mode.

If the equipment can be configured to operate with different Nominal Channel

Bandwidths (e.g. 20 MHz and 40 MHz) and different data rates, then the combination of the smallest channel bandwidth and the lowest data rate for this channel bandwidth which still allows the equipment to operate as intended shall be used.

Remark:

Test frequency:

Lowest frequency: (2405MHz), Highest frequency: (2475MHz)



7.7.4 TEST RESULTS

Test Date (yy-mm-dd): 2023-12-01  
Test Engineer: Huang Tianmei  
Test environment: Normal condition: 24.4℃/65%RH/101.0kPa

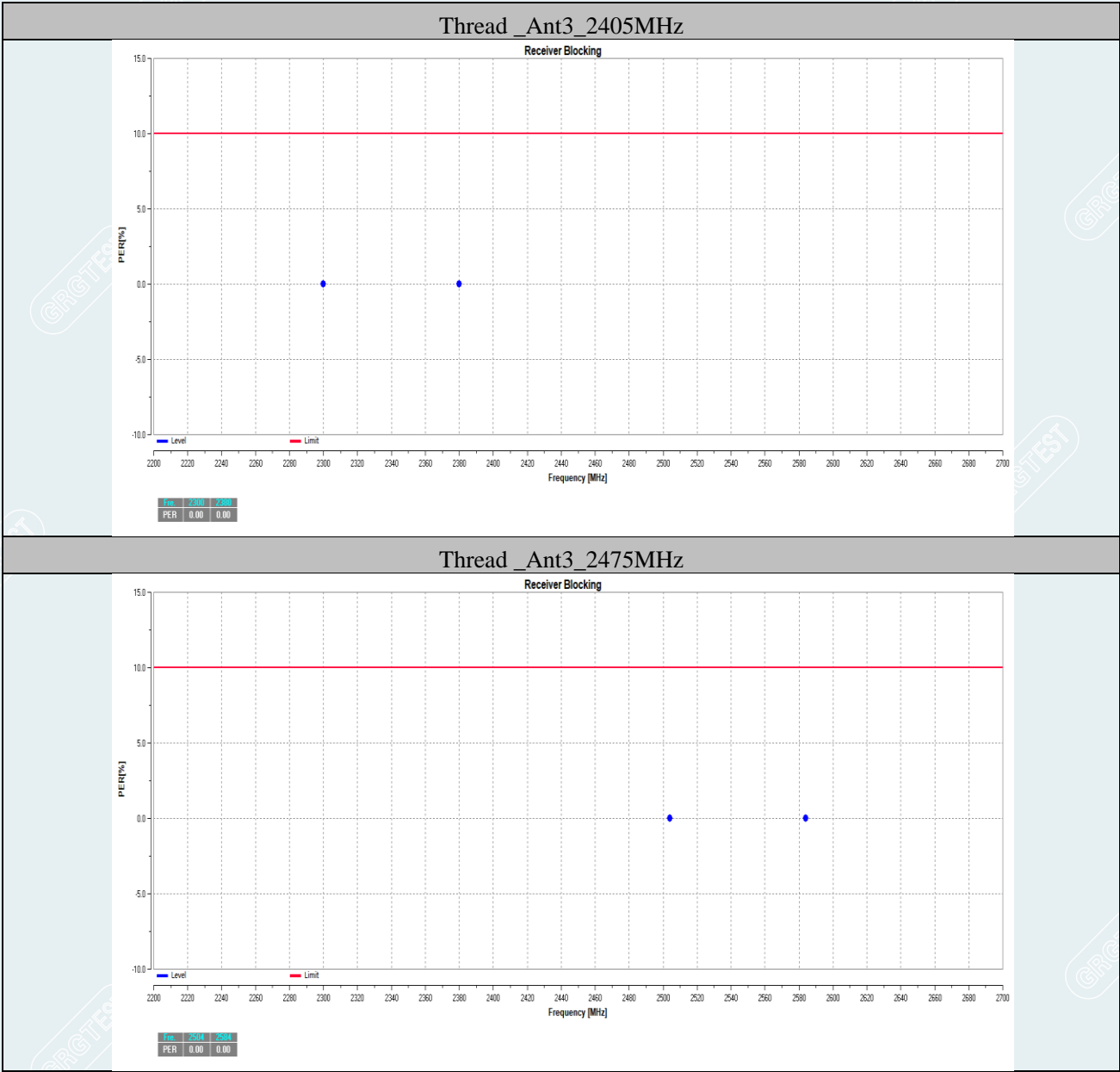
Receiver Blocking							
Receiver Category 2							
Test Mode	Frequency (MHz)	Wanted signal (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PER(%)	limit(%)	Test Result
Thread	2405	-65	2300	-33.5	0.00	10	Pass
			2380		0.00	10	Pass
	2475	-65	2504		0.00	10	Pass
			2584		0.00	10	Pass

Remark: CW=signal power(-34dBm) + Antenna Gain(0.5dBi).

----- The following blanks -----



7.7.5 TEST SCREENSHOTS



#### **APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM**

Please refer to the attached document E20230331478001-28 CE-Test Photo.

#### **APPENDIX B. PHOTOGRAPH OF THE EUT**

Please refer to the attached document E20230331478001-29 EUT photo.

----- End of Report -----